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UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

FOREST INSECT INVESTIGATIONS

REPORT OF PINE BEETLE SURVEYS OF THE KENO AREA KLAMATH WORKING CIRCLE

A Protection Unit of the
Klamath Forest Protective Association
Klamath Falls, Oregon

September 1938

By
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Senior Entomologist
Bureau of Entomology & Plant Quarantine

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Portland, Oregon.

U. S. GOVERNMENT PRINTING OFFICE 60918

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Introduction

Since 1921, pine beetle surveys of the Keno Area in Klamath County have been made annually for the purpose of determining the trend of beetle epidemics in the ponderosa pine stands of this area, and to determine the need for control work. The earlier surveys were made in connection with the Southern Oregon-Northern California Pine Beetle Control Project, subsequently by the Bureau of Entomology and Plant Quarantine as a part of the regional bark beetle survey program. Some of the older sample plots now have 18 years of continuous loss records which show the rise and fall of beetle epidemics and these plots are becoming increasingly valuable in the interpretation of bark beetle behavior and infestation trends.

The last report summarizing bark beetle infestation data for this area was made in 1933, and hence in the present report loss figures on sample plots are reviewed since 1933 and data obtained in recent surveys added, in order to bring the history of infestation on this area up to date.

For the past six years, three annual surveys have been conducted in close cooperation with the Forest Service, and in some years with field assistance furnished by the CCC. In 1933 and 1934 Mr. Whiteside cruised the sample plots with the help of CCC enrollees. Messrs. Smith and McLean were detailed to this work from the O & C camp at Moon Prairie in 1933, and in 1934 Messrs. Young and Close were assigned to this job from the Rogue River National Forest camp at Union Creek. During 1935, a three-man crew financed from Forest Service S & E and ECW funds, and working under the technical supervision of the Forest Insect Laboratory, not only recruised the sample plots but ran extensive strips through the Aspen Lake and Pinehurst Areas, thus broadening the base for loss estimates. This crew consisted of D. Lester Lynch, in charge; Jack Trust, and Henry Campbell. Again in 1936, the Forest Service financed the survey 50-50 from ECW and S & E funds. A three-man crew consisting of Jack Wood, in charge; Franklin C. Brame, and Claire I. Gordon, cruised the plots and again ran strips through the area to obtain a general estimate of losses. In 1937, CCC student assistants were assigned to this work and a three-man crew consisting of Richard F. Goodall, Alfred G. Crum, and Ronald M. Fishback covered the sample plots of the Keno Area. The 1938 survey was conducted by a three-man Bureau of Entomology and Plant Quarantine crew consisting of Ashley A. Poust, in charge; George P. Foley, and Kendall B. Wood working under the supervision

of the writer, who made the general estimates for the area as a whole. Computations of timber cruises and loss statistics have been conducted in the office of the Forest Insect Laboratory, partly by temporary help but mainly by Mr. Whiteside and the writer.

Description of the Area

The Keno Area includes the pine timberlands lying west of Klamath Falls, Oregon, east of the Greensprings divide, and from the lower slopes of Aspen Mountain and Buck Mountain in the Rogue River National Forest south to the California line. (It was formerly designated as Area 1 of the Southern Oregon-Northern California Pine Beetle Control Porject and as Area 1, Unit 1 by the Klamath Forest Protective Association). The timber is largely owned by the Weyerhaeuser Timber Company but includes some acreage of Oregon-California Land Grant lands, a small acreage of the Rogue River National Forest, and small areas of private lands belonging to dher owners. Protection from both fire and insects is provided by the Klamath Forest Protective Association.

The area originally carried one of the finest commercial ponderosa pine-sugar pine forests to be found in Oregon, much of it running to Sites II and III, and with volumes up to 30 M board feet per acre. In 1921, this area, including some timberland in California, was estimated at 311,000 acres and as carrying a ponderosa pine stand of 3,730,000 M board feet. Since then there has been a continuous depletion of old-growth stands by both beetles and fire. In 1928, logging operations were started by the Weyerhaeuser Timber Company, and up to now these operations have covered a large part of the Clover Station, Pokegama, and adjacent units. The Chase Butte Unit, lying south of the Klamath River, has been mostly cut or burned over, and is no longer of much importance from the beetle damage standpoint. So at the present time, the old-growth stands still subject to beetle damage are greatly reduced over what they were in 1921. (See map attached).

The estimated timber acreage and pine volumes on the Oregon portion of the area at the present time are given in the following table:

Table No. 1

Acreage and Timber Resources
as of Jan. 1, 1938

Ownership	Timbered Acres	Volume of Pine MBM	Percent of Stand
Rogue River National Forest	15,000	250,000	13.5
O & C Land Grant	56,000	380,000	20.5
Private Lands	235,000	1,200,000	64.9
Other	4,000	20,000	1.1
Total	310,000	1,850,000	100.0

(The reduction in stand inventory from 3,730,000 MBM in 1921 to 1,850,000 MBM in 1938 may be due in part to differences in estimates, as well as depletion from insects, fire, and cutting. The 1921 estimate was based on known acreages and estimated average volume per acre for different classes of land, while the 1938 figure has been derived from compilation of the Forest Resource Survey of 1934 and corrected for cutting depletion since then.) While the stand volumes may be only approximations, they do reflect the general change in timber stand conditions which have taken place on this area during the past 18 years.

Pine Beetle Damage.

As in other portions of the ponderosa pine region, the western pine beetle (Dendroctonus brevicomis Lec.) has been the most destructive forest insect in this area. The mountain pine beetle (D. monticolae Hopk.) attacks and kills a few sugar pines from time to time and Ips beetles work in young trees, particularly around logging areas, but this damage is relatively unimportant.

Fluctuations in annual loss from beetle attack have responded to a number of factors, principally variations in moisture conditions, freezing temperatures, and control work. Since 1921 there have been three periods of epidemic infestation. (See chart

attached). The first reached a high point in 1926, then declined to a low in 1930; the second epidemic reached a high in 1931 and then declined to a low in 1933, due to the effects of the 1932-33 freeze; and then the third reached a peak in 1934. This sudden rise in 1934 illustrates how quickly an epidemic of this beetle may build back following a reduction in beetle population due to cold weather. Since 1934, due to control work and improved tree growth and resistance to beetle attack, losses have rapidly declined and are now down to the lowest level reached since 1921, when continuous plot records were started.

The trend of losses on sample plots with continuous records is graphically illustrated in the chart accompanying this report. The record of cruised losses on sample plots from 1933 to 1937 is given in detail in Table No. 2 and summarized in Table No. 3. Estimated timber losses from pine beetles for 1937 are shown by units in Table No. 4, and the previous record of timber losses is summarized in Table No. 5.

The total loss for 1938 can only be estimated on the basis of partial cruises made from July 25 to August 4, 1938. On sample plots the comparison of 1937 to 1938 losses is indicated as follows:

Unit	Trees Spotted on Check Sections				
	1937 Loss		1938 Loss		
	S*	Total Cruised	S*	Total Estimated	Remarks
Jenny Creek	16	47	4	16	Controlled in 1937-38.
Johnson Prairie	9	47	6	20	Controlled in 1937-1938.
Pokegama	15	39	13	47	Not treated-- 12% increase.
Aspen Lake, Sec.34	14	51	34	106	Not treated-- 108% increase.
Aspen Lake, Sec.16	14	79	36	120	Not treated-- 52% increase.

*S - Summer loss marked at time of first cruise.

As will be noted from the above table, the Jenny Creek and Johnson Prairie plots show a substantial reduction as a result of the control work conducted during the spring of 1938. On the other hand, plots on the Aspen Lake Unit, where no control work was done, indicate an 80 percent increase in 1938 infestation over that of 1937. This may be due in large part to the disturbance caused by logging now in progress on this unit.

Control Work.

The Klamath Forest Protective Association has carried on an almost continuous campaign of beetle control on this area since 1911. A large program of control was conducted during the period 1921 to 1924 as a part of the Southern Oregon-Northern California Pine Beetle Control Project. Since then, control has been carried on from time to time as beetle activity developed on different units.

The work conducted since 1933 is shown in Table No. 6, the largest program being that of the spring of 1936 on the Aspen Lake Unit, when 3,926 infested trees were treated on approximately 12,000 acres. Again, in the spring of 1938, an extensive control program was conducted in the Jenny Creek, Johnson Prairie, and Pokegama units, and 1,007 trees were treated. The effect of this work is shown in the noticeable reduction of losses as indicated in this year's cruise.

Except for the Aspen Lake Unit, where logging is now in progress, the Keno Area is remarkably free from epidemic infestation. While no control work appears advisable for the coming season, the area should be watched and maintenance control applied whenever an increase in beetle activity appears imminent.

Table No. 2

Pine Beetle Damage on Sample Plots
Keno Area -- Klamath Basin
1933 - 1937

Unit and Plot Location	Acres Timbered	Stand Vol. 1931 MBM	Site	Beetle Losses: Year of Attack	Trees Killed	Volume Killed	Bd.ft. per A.	% Stand	Remarks
				1933	85	63,700	100	.6	Affected by freeze.
Aspen Lake				1934	203	187,970	293	1.9	
T 37S, R 7E, Sec 34	640	10,009	3-	1935	219	148,750	232	1.5	Treated in spring of 1936.
				1936	48	41,020	64	.4	
				1937	51	47,690	74	.5	
				1933	81	74,400	124	.7	Affected by freeze.
Eagle Ridge				1934	189	194,030	323	1.9	
T 37S, R 7E, Sec 16	600	10,243	3-	1935	224	134,640	224	1.3	Treated in spring of 1936.
				1936	79	52,030	87	.5	
				1937	79	55,380	92	.5	
				1933	117	57,520	93	1.2	
Jenny Creek				1934	190	93,940	151	2.0	
T 40S, R 4E, Sec 34	620	4,681	4	1935	82	55,920	90	1.2	
				1936	28	29,880	48	.6	
				1937	45	26,430	42	.6	Treated in spring of 1938.
				1933	80	114,490	182	1.0	
Johnson Prairie				1934	84	100,590	160	.9	
T 39S, R 5E, Sec 7	630	10,869	2-	1935	60	64,750	103	.6	
				1936	56	73,100	116	.7	
				1937	49	57,030	90	.5	Treated in spring of 1938.
Klamath Canyon									
T 41S, R 6E, Sec 9	150	379	4-	1933	34	14,710	98	5.9	
				1933	97	74,360	155	2.0	
Pokegama				1934	215	165,400	345	4.5	
T 40S, R 5E, Sec 36	480	3,648	4	1935	114	67,050	140	1.8	
				1936	39	26,530	55	.7	
				1937	39	29,310	61	.8	
Round Lake				1933	110	96,140	172	2.0	
T 39S, R 8E, Sec 5	560	4,679	4	1934	465	326,980	583	7.0	

Table No. 3

Summary of Cruising Data
on Sample Plots
Keno Area

Year of Attack	Totals for All Plots						Totals for Continuous Plots					
	Acres Cruised	Trees Killed	Volume Killed	Trees per Section	Bd. ft. per Acre	% Stand	Acres Cruised	Trees Killed	Volume Killed	Trees per Section	Bd. ft. per Acre	% Stand
1931	4,320	1,938	1,778,330	287	385	3.25	2,970	898	865,510	193	291	2.19
1932	4,320	1,655	1,335,000	248	310	2.43	2,970	804	656,490	173	221	1.66
1933	3,680	604	495,330	105	135	1.11	2,970	460	384,475	99	129	.97
1934	3,530	1,346	1,068,910	244	302	2.42	2,970	881	741,925	189	250	1.88
1935	2,970	699	471,110	151	158	1.19	2,970	699	471,110	151	158	1.19
1936	2,970	250	222,560	54	75	.56	2,970	250	222,560	54	75	.56
1937	2,970	263	215,840	57	73	.54	2,970	263	215,840	57	73	.54

Table No. 4

Estimated Ponderosa Pine Losses for 1937
on Units of the
Keno Area

Unit	Acreage		Volume Jan. 1938	Estimated 1937 Loss			
	Total	Virgin Pine	Pine MBM	Trees	Volume MBM	Bd.Ft. Per Acre	Percent of Stand
Jenny Creek	40,000	29,000	300,000	2,000	1,200	41	.40
Johnson Prairie	44,000	36,000	550,000	1,700	1,950	54	.35
Pokegama	58,000	22,000	320,000	2,100	1,200	55	.38
Clover Station	36,000	2,000	30,000	2,000	100	50	.33
Buck Lake	18,000	10,000	200,000	500	350	35	.17
Aspen Lake	46,000	22,000	350,000	2,400	1,260	57	.36
Round Lake	18,000	3,000	40,000	800	170	57	.42
Chase Butte	50,000	6,000	60,000	1,500	270	45	.45
Total	310,000	130,000	1,850,000	13,000	6,500	50	.35

Table No. 5

Estimated Beetle Losses in the Keno Area
Acreage and Stand in 1921

Area - 311,000 Acres. Volume of Stand - 3,730,000 MBM.

Year	Trees Killed	Volume Killed	Percent of 1921 Stand
1921	32,000	34,970	.93
1922	24,000	26,040	.70
1923	19,800	22,330	.60
1924	38,500	39,900	1.07
1925	78,000	73,590	1.97
1926	54,000	52,550	1.41
1927	42,400	40,530	1.09
1928	38,000	33,880	.91
1929	37,600	35,270	.95
1930	30,000	29,000	.78
Total for Decade	394,300	388,060	10.40

Acreage and Stand in 1931

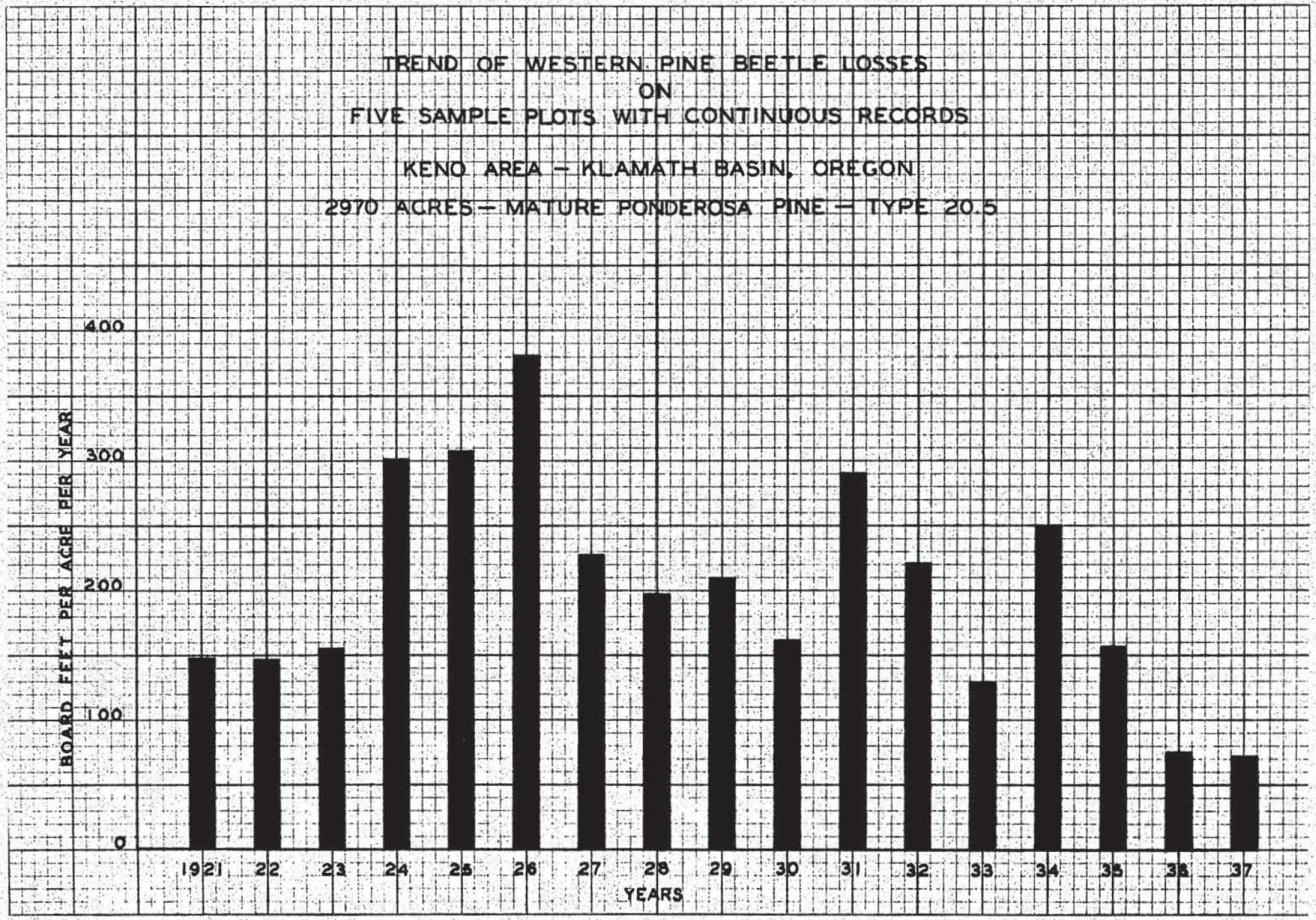
Area - 310,000 Acres. Volume of Stand - 2,250,000 MBM.

Year	Trees Killed	Volume Killed	Percent of 1931 Stand
1931	50,000	44,000	1.95
1932	33,000	31,000	1.38
1933	18,000	17,000	.76
1934	33,000	31,000	1.38
1935	20,000	16,000	.71
1936	14,000	7,500	.33
1937	13,000	6,500	.30
Total for 7 Years	181,000	153,000	6.81

Table No. 6

Control Work Conducted on the
Keno Area
1933 - 1937

Control Period	Unit	Trees Treated	Volume Treated-MBM	Acres Covered	Cost	Work Done By
Fall, 1934) Spring, 1935)	Pokegama Johnson Prairie	1,051	1,055	4,880	$2,124	KFPA
Spring, 1936	Aspen Lake	3,926	4,421	11,720	8,410	KFPA
Spring, 1937	Round Lake Pokegama	231	296	2,640	967	KFPA
Spring, 1938	Jenny Creek Johnson Prairie Pokegama	1,007	1,407	13,680	4,723	KFPA


TREND OF WESTERN PINE BEETLE LOSSES
ON
FIVE SAMPLE PLOTS WITH CONTINUOUS RECORDS
KENO AREA – KLAMATH BASIN, OREGON
2970 ACRES – MATURE PONDEROSA PINE – TYPE 20.5
BOARD FEET PER ACRE PER YEAR
400
300
200
100
0
1921
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
YEARS

TREND OF WESTERN BLUE BUTTE OIL PRODUCTION
ON
FIVE SPOT PILOT WITH CONTINUOUS WATER FLOOD
KERN COUNTY — KERN RIVER AREA — MIDWAY BASIN CALIFORNIA
SEC. 32, T. 29 S., R. 27 E., M.D.B. & M. — ELEVATION OF KELLY BUSHING 1,000 FEET ABOVE SEA LEVEL
BARRELS OF OIL PER DAY
GRAPH PLOTTED FROM MONTHLY PRODUCTION REPORTS
1951
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
0
100
200
300
400
500
600
700
800
900
1000

1938 PINE BEETLE SURVEY OF PONDEROSA PINE IN OREGON AND WASHINGTON

KENO INFESTATION AREA
KLAMATH BASIN, OREGON

LEGEND

AREA BOUNDARIES

UNIT BOUNDARIES

1937 BEETLE LOSS

0-25 trees per section. Normal infestation. Roughly about 0 to 1/4 of one percent of stand volume.

25-50 trees per section. Normal infestation. 1/4 to 1/2 of one percent of stand volume.

50-100 trees per section. Light epidemic infestation. 1/2 to 1 percent of stand volume.

100-200 trees per section. Moderate epidemic infestation. 1 to 2 percent of stand volume.

200-400 trees per section. Heavy epidemic infestation. 2 to 4 percent of stand volume.

Over 400 trees per section. Very heavy epidemic infestation. Over 4 percent of stand volume.

PONDEROSA PINE TYPES

Solid colors. Stands containing more than 50% ponderosa pine and of average or better thrift and vigor. In these stands the western pine beetle is the chief tree-killing agent.

Cross-hatched colors. Stands containing from 20-50% ponderosa pine.

Dotted colors. Ponderosa pine stands of marginal or fringe type. In many of these areas drought as well as insects is an important tree-killing factor.

Diagonal colors. Cut-over stands.

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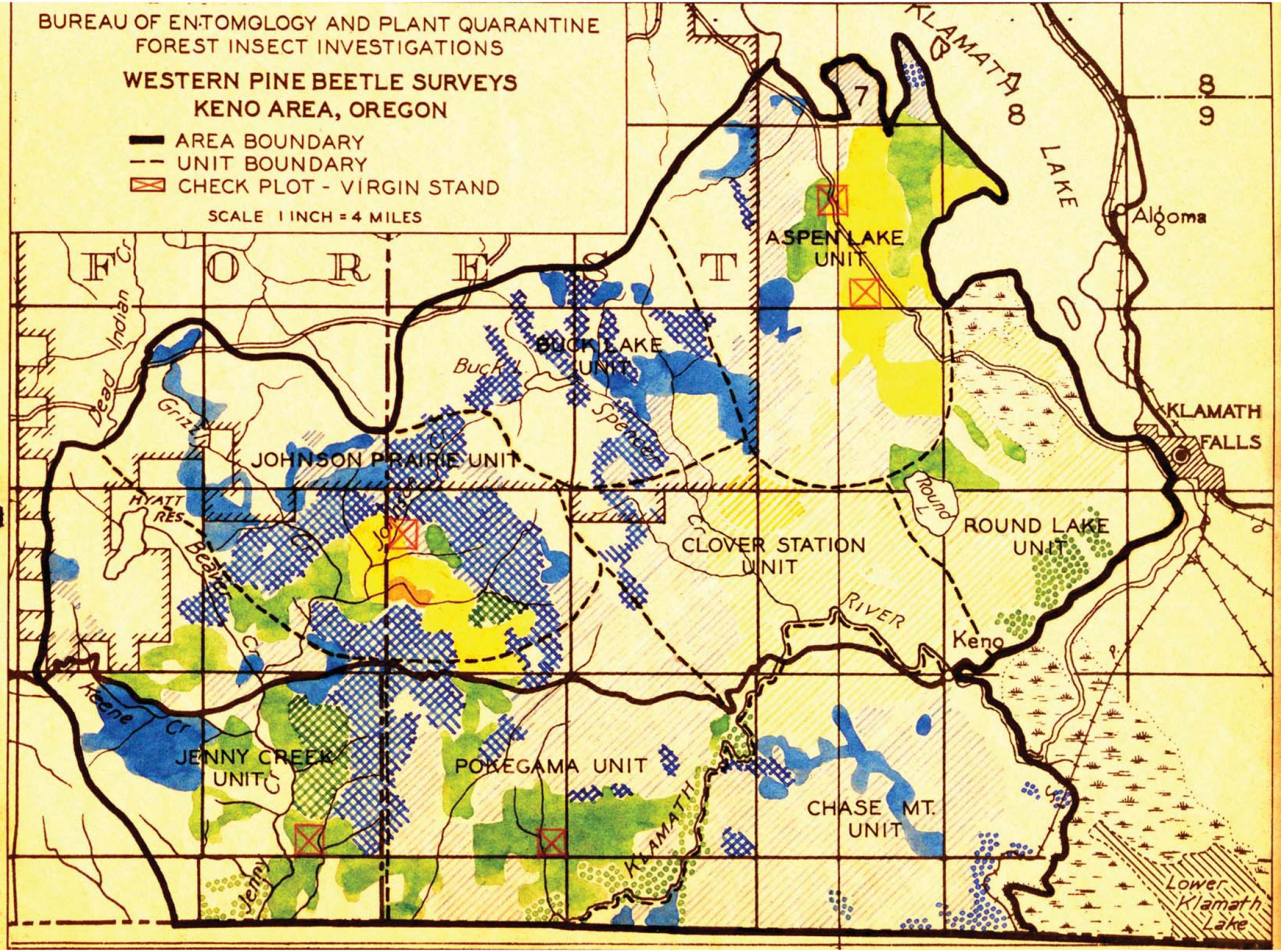
Portland, Oregon


BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
FOREST INSECT INVESTIGATIONS
WESTERN PINE BEETLE SURVEYS
KENO AREA, OREGON
AREA BOUNDARY
UNIT BOUNDARY
CHECK PLOT - VIRGIN STAND
SCALE 1 INCH = 4 MILES
KLAMATH
LAKE
7
8
8
9
Algoma
ASPEN LAKE UNIT
FOREST
Dead Indian
Cr
Buck L
Buck
Spencer
BUCK LAKE UNIT
Grizzly
JOHNSON PRAIRIE UNIT
KLAMATH FALLS
HYATT RES
Beaver
Cr
Round L
ROUND LAKE UNIT
CLOVER STATION UNIT
RIVER
Keno
Keene Cr
JENNY CREEK UNIT
POLEGAMA UNIT
KLAMATH
CHASE MT. UNIT
Jenny
Lower Klamath Lake